**“UNIT” – LESSON PLAN**

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| Lesson 2 | Magnetic Properties |
| Overview  Standard(s)  & Objectives | Overview:  In this lesson, students will discover several properties of magnets, and predict and test objects for magnetic properties.  Standards:  3-PS2-1 Plan and carry out an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. (SEP:3; DCI: PS2.A, PS2.B; CCC: Cause/Effect)  3-PS2-2 Make observations and/or measurements of an object’s motion to provide evidence for how a pattern can be used to predict future motion. (SEP: 3; DCI: PS2.A; CCC: Patterns)  3-PS2-3 Ask questions about cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. (SEP: 1; DCI: PS2.B; CCC: Cause/Effect)  3-PS2-4 Define a simple design problem that can be solved by applying scientific ideas about magnets. (SEP: 1; DCI: PS2.B; CCC: Technology)  5-PS1-3 Make observations and measurements to identify materials based on their properties. (SEP: 3; DCI: PS1.A; CCC: Scale/Prop.)  Objectives:  Students will be able to identify properties of magnets.  Students will be able to make and test their own hypotheses.  Students will be able to classify objects as magnetic or nonmagnetic.  Students will be able to organize information.  Students will be able to distinguish between magnets and other magnetic materials. |
| Background  Information | Existing within the earth itself, magnetism can levitate objects, act through solid objects and pull on things without touching them. Magnetism is what makes electric motors spin, loudspeakers and earphones work, refrigerator doors stay closed, and all household electricity possible.  Although permanent magnets can be manufactured in many different forms, they all share a common characteristic: they must contain either iron, or nickel, or cobalt, or a combination of these elements. |
| Launch (5 min.) | |
| Materials | * Student notebooks   *For each group of four students*   * A variety of magnets * 1 package containing assorted materials, which may include the following: * wooden stick * wooden toothpicks * piece of string * plastic cup * plastic drinking straw * battery * small, motorized toy, with batteries * paper clips * aluminum foil * aluminum screen * aluminum wire * brass fastener * brass washer * copper wire * golf fee * pipe cleaner * rubber band * steel washer * twist-tie |
| Prior Knowledge | 1. Remind students of the anchoring event (spinning compass motor) and refer to any observations or hypotheses students made about magnets. Explain that, in this lesson, they will have the chance to discover more about the properties of magnets. 2. Explain that, for this lesson, students will be working in groups of four. Each group will share one set of materials. Outline the procedures for collecting, using and returning materials (sharing, care, location). You may wish to appoint a “Materials Manager” in each group to look after the supplies. |
| Goals and  Expectations | Scientists continually ask new questions and seek answers, often because of new observations. It is important for students to understand that learning science is not so much a process of being right or wrong as it is of finding out new things.  Students will need to be able to distinguish between a magnet (an object that attracts and repels another magnet) and something that is made of a magnetic material (an object that is attracted to a magnet, but not repelled).  In this lesson, it is important for students to discover that copper and aluminum are not magnetic. Later in the unit, they will learn that electricity moving through these materials will make them temporarily magnetic. The magnetic effect of electric current will be easier for students to comprehend if they first learn that not all metal wires are magnetic. |
| Explore (30 min.) | |
| Procedure | 1. Ask students how they would decide whether something is magnetic or not. Also ask them to suggest ways to tell if an object is only very slightly attracted to a magnet. 2. Explain to students that their task is to predict whether each object is magnetic or nonmagnetic and then to test their predictions. 3. Ask students for their ideas about how best to organize the information in their science notebooks. All group members will record the information. Encourage them to record in a way that makes sense to them. 4. Provide each group of four students with a package of materials. Students can then begin to list each object to be tested and their predictions about whether it is magnetic or not. Remind them that it is more important for them to think about what they are learning that to worry about making correct predictions. 5. Once predictions are completed, distribute magnets and have students begin testing the materials. Students record their findings. |
| Questions | Questions for Student Exploration:  Observation Level:   * What similarities do you notice among the magnetic objects? * How could magnets be used to hold a door closed?   Unobservable (or less observable) Level:   * What do you think makes an object magnetic? * How can you use magnets to help find out what certain things are made of?   “What If” Scenarios:   * What if you connected a series of magnetic materials to one magnet? * What if you put a nonmagnetic object between a magnet and an object made of magnetic material? * What if all coins were strongly magnetic?   Teacher Tips:  Extension:  Students can find things outside of school that use magnets. Encourage them to record their findings in their science notebooks. |
| Summarize (15 min.) | |
| Communicate | Gather students together and have them share what they found out. Guide the discussion toward drawing conclusions and solidifying key concepts (see below).  Ask them to discuss how they would distinguish between a magnet and something that is made of magnetic material. Evaluate whether students have learned that two magnets can attract one another, while two objects made of magnetic material cannot attract one another. You may demonstrate this difference by using two magnets first, then two paper clips.  Have students use words and/or pictures to create a journal entry in their science notebooks, answering the question, “What can magnets do?” |
| Terminology and Concepts to Solidify | Attract  Magnetic/nonmagnetic  Magnet/magnetic material  Not all metals are magnetic.  There is a difference between magnetic materials and magnets.  Some objects that are nonmetallic contain magnetic metal. |
| Connection  to Big Ideas (Phenomena) | The spinning compass motor uses magnetic attraction and repulsion to move the magnets attached to the straw toward and away from the electromagnet. |
| Follow Up/Practice | Students can further explore what magnets can do using a variety of objects and materials. |
| Assessment | Observe students as they are working in groups.   * How do students use the materials? * Do they generate their own ideas or do they usually copy what other students have discovered? * Do they talk about what they think is happening?   Review the entries in students’ science notebooks. Look for understanding and partial understanding of the big science concepts.   * Were ideas clearly organized? * Were objects correctly classified as magnetic and nonmagnetic? * Do students use specific science vocabulary? * Are any misconceptions evident? |